

# Gold Nanoparticles Create Visible-light Catalysis in Nanowires

*Silver nanowires have been extensively studied and used for a variety of applications, including transparent conductive electrodes for solar cells and optoelectronic devices. Chemically transforming and modifying silver nanowires enables the synthesis of nanowires made of varying compositions, thus expanding their use to applications such as catalysis and water purification.*

## The Challenge

Silver nanowires have unique electrical and optical properties that make them a popular nanomaterial. However, application of silver nanowires in the energy sector (e.g. solar energy conversion) is still difficult because of its simple metallic composition.

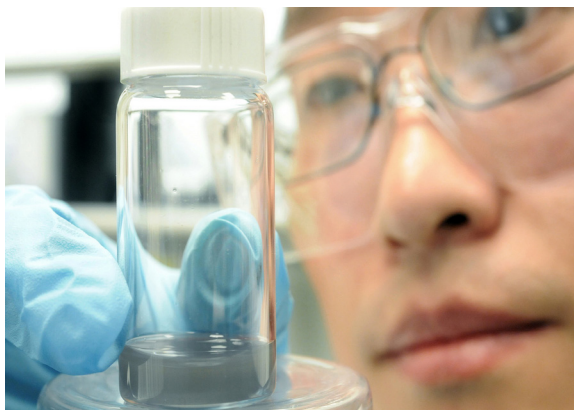
## The Solution

Argonne nanoscientists have achieved visible-light catalysis with silver nanowires by chemically converting them into semiconducting silver chloride nanowires and decorating them with gold nanoparticles. These novel nanowires have a completely new set of properties that are significantly different from the original nanowires, including the ability to break down organic molecules in polluted water.

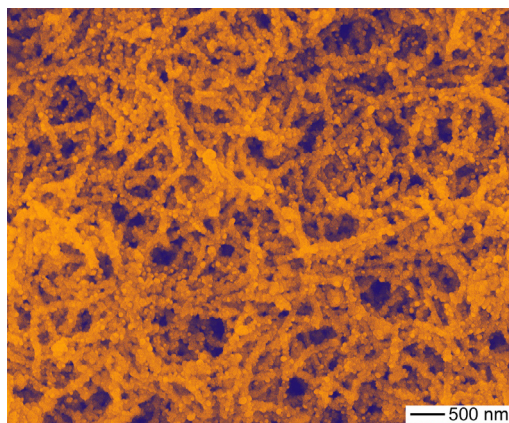
## The Results

The visible light excites the electrons in the gold nanoparticles and initiates reactions that culminate in charge separation on the silver chloride nanowires. Tests have already shown that gold-decorated nanowires can decompose organic molecules such as methylene blue.

It is possible to use a similar mechanism to deposit other metals such as palladium and platinum onto the silver chloride nanowires and create new properties, such as the ability to catalyze the splitting of water into hydrogen with sunlight.



*Argonne scientist Yugang Sun examines silver chloride nanowires. The nanowires, when decorated with gold nanoparticles, can have pollution-controlling properties.*



*The gold-coated silver chloride nanowires at the microscopic level.*

*"If you were to create a film of gold-decorated nanowires and allow polluted water to flow through it, the organic molecules may be destroyed with visible irradiation from conventional fluorescent light bulbs or the sun," said Argonne nanoscientist Yugang Sun.*